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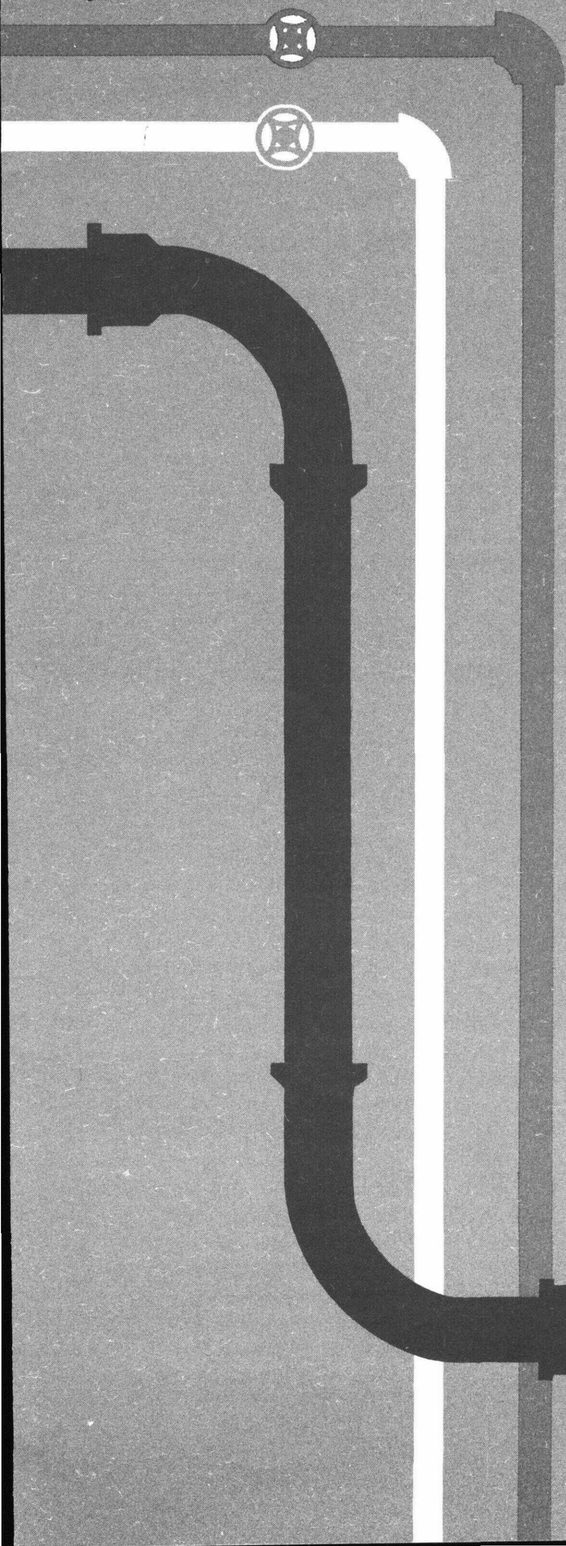
FARMERS BULLETIN NO. 2213 • U.S. DEPARTMENT OF AGRICULTURE

Supersedes Farm. Bul. 1426
revised 3/1968



PLUMBING for the home and farmstead

CONTENTS

This bulletin deals primarily with the installation of plumbing in new construction, but the general principles also apply when adding or remodeling plumbing in existing buildings.

Related information is discussed in the publications listed below. Single copies are available from the U.S. Department of Agriculture, Washington, D.C., 20250. Send your request on a post card.

	Order No.
Electric Water Pumps on the Farm	L 436
Farmstead Sewage and Refuse Disposal	AB 274
Planning Bathrooms for Today's Homes	G 99
Simple Plumbing Repairs for the Home and Farmstead	F 2202

This bulletin supersedes Farmers' Bulletin 1426, "Farm Plumbing."

Washington, D.C. Issued March 1966

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 Price 10 cents

PLUMBING

for the Home and Farmstead

By H. L. GARVER, formerly agricultural engineer, and J. W. ROCKEY, agricultural engineer, Agricultural Engineering Research Division, Agricultural Research Service [1]

Careful planning and proper installation are essential for a safe and adequate plumbing system in the home or other farmstead buildings.

Installation of plumbing requires special knowledge and tools and should be done by, or under the guidance of, an experienced person. It must be done in accordance with applicable State, county, or local plumbing codes. Code requirements take precedence over recommendations given in this bulletin.

Planning the plumbing system should be done by the family, who know most about their own living habits and needs. A knowledge of the kinds of piping, fixtures, and other equipment required and available will aid in planning. Also, advice should be obtained from qualified persons.

PLANNING

In planning a plumbing system, consider your future needs as well as your present. It costs less to install a few extra tees with plugs for future connections than it does to cut into a plumbing system to make connections later on.

Adding or remodeling plumbing in existing buildings involves the additional expense and labor of opening up walls or floors. It may be more economical to run piping along the exposed face of a wall or floor and then box it in for appearance.

In the home, there are at least three areas where water is needed—the kitchen, the bathroom, and the laundry. Around the farmstead, water is needed in the dairy barn and milkhouse, in other buildings where stock are kept or watered, in the shop, and in the yard or family garden. The location of appliances, fixtures, and faucets in each of these areas must be planned in advance.

Planning a plumbing system also includes providing for proper drainage of wastes. Improper handling of wastes can lead to contamination of the water supply and consequent spread of diseases. Poor planning or workmanship can also mean hours of unpleasant work in repairing or clearing clogged drains.

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[1] This publication has been reviewed by the U.S. Department of Agriculture Committee on Rural Sanitary Engineering and by the Public Health Service, U.S. Department of Health, Education, and Welfare.

Plumbing costs can often be kept down by good planning in locating fixtures. Fixtures located back to back on opposite sides of a wall, as shown in figure 1, save on piping. Locating all bathroom fixtures on one wall, as shown in the illustration, also saves piping. In the arrangement shown in figure 1, one vent stack serves all fixtures.

Figure 2 shows a vertical arrangement of fixtures to reduce the amount of piping needed in multistoried houses. Locating fixtures in a continuous line, as shown in figures 3 and 4, saves piping in single-story houses.

A water heater should be located as close as practical to the fixture where hot water will be used most frequently. Long runs of hot water pipe result in unnecessary use of water and heat.

Precautions

Every precaution must be taken to insure a safe water supply and otherwise protect the health of the family. When installing plumbing, be sure that—

- There are no leaks in the drainage system through which sewage or sewer gases can escape.
- There are no cross connections between the water-supply system and any other piping carrying water or other materials.
- All fixtures are designed and installed so that there can be no back siphonage from the fixture into the water-supply system. This precaution also applies to fixtures, such as water bowls, installed in service buildings for use by animals.

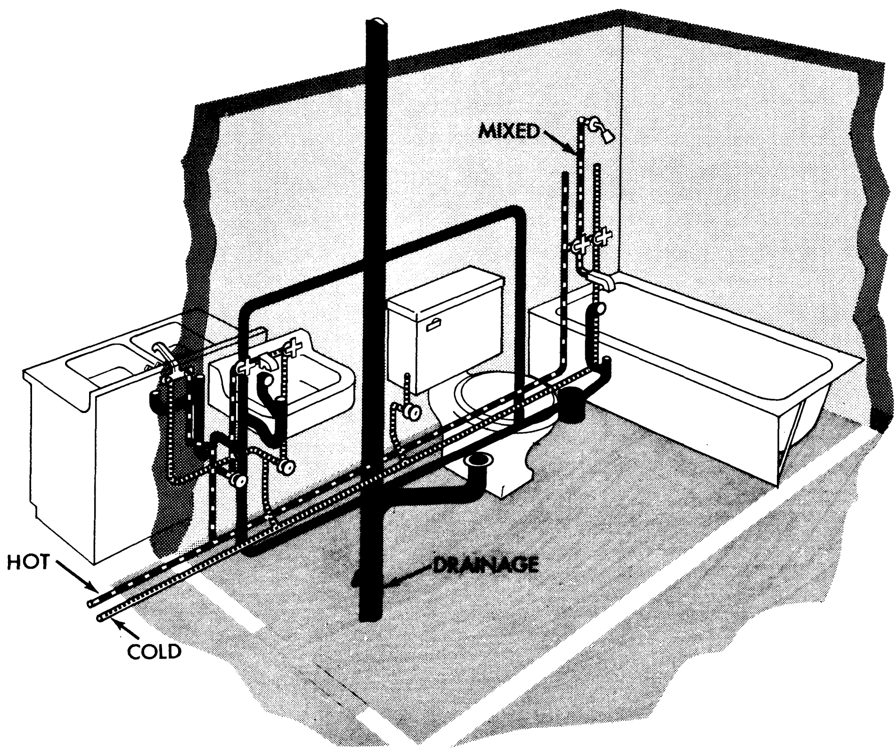

Figure 1.—Plumbing fixtures located back to back on opposite sides of a wall.

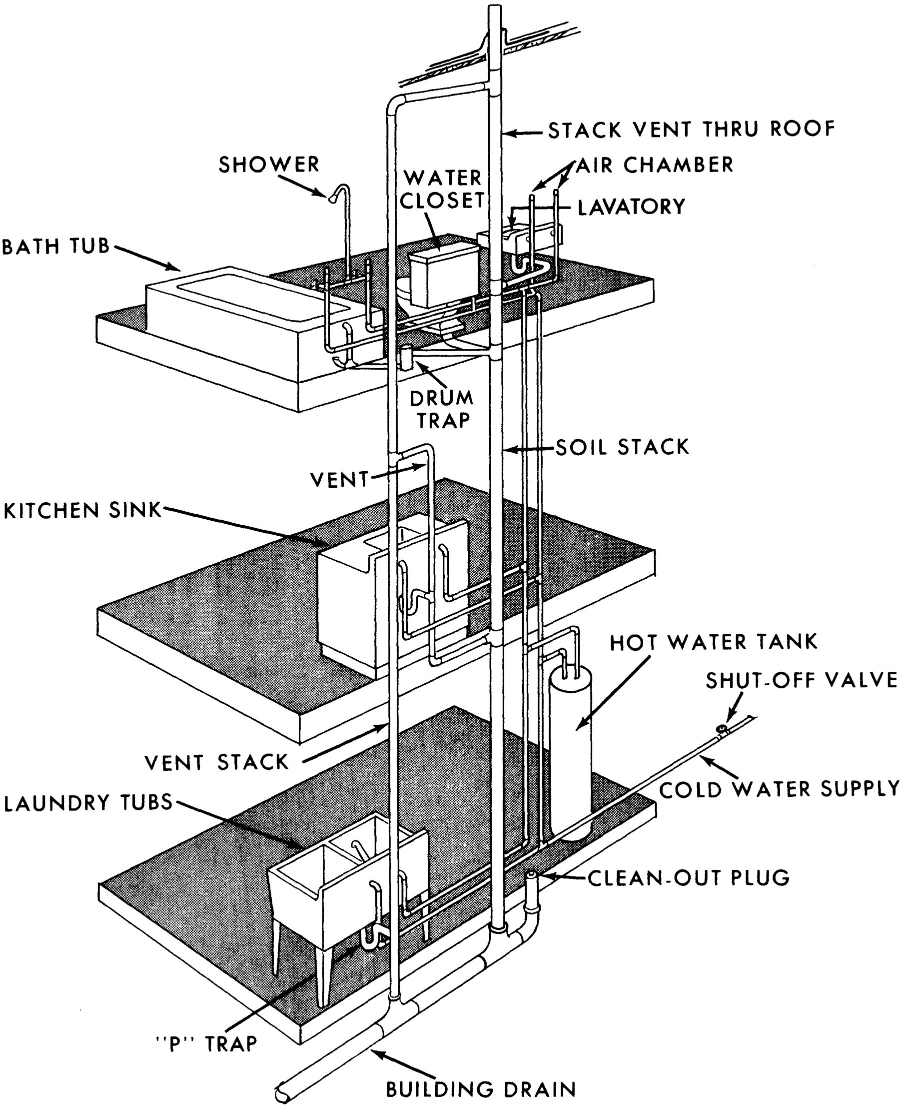

Figure 2.—Plumbing arrangement in a two-story house with basement.

ROUGHING-IN

The term "roughing-in" refers to placing the piping that will be concealed in the walls or under the floors of a building during construction or remodeling. The fixtures are normally connected to this piping after construction work is completed. Future fixtures may also be provided for in this manner. Building drains may be laid under concrete floors before the superstructure framing is started.

Roughing-in includes installation and testing of the water-supply and drainage piping and the fixture supports. The location and height of sinks, lavatories, and other fixtures must be precisely indicated on the

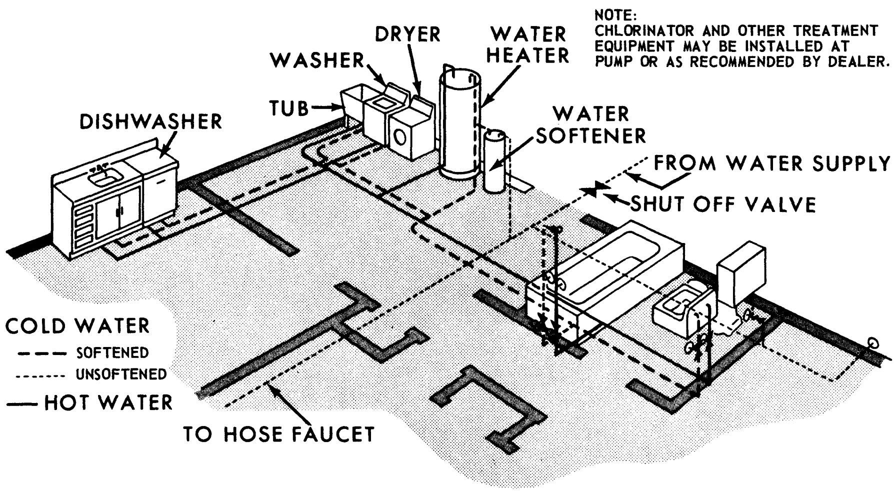

Figure 3.—A fixture and water-supply-piping layout for a one-story house.

building plans to insure correct installation of the piping and supports. For sinks a height of 36 inches and for lavatories a height of 33 to 35 inches, measured from the floor to the top of the rim, should suit most adults. Some families may find it more convenient to have the fixtures slightly higher or lower.

After the roughed-in work is completed, and before it is concealed, the plumbing system should be tested for leaks. Local plumbing codes usually include a standard testing procedure. Where no code is in effect, the drainage and water-supply systems may be tested as follows:

Drainage system.—Tightly plug all openings, except the highest one. Fill the system with water, and let the water stand for about 15 minutes. Then check the entire system for leaks.

The system can be checked by sections. If done that way, test each section under a head (depth, measured vertically) of water of at least 10 feet to be sure that each section and joint will withstand at least that much pressure.

Water-supply system.—This system can be tested in the same way as the drainage system, but only potable (drinkable) water should be used, and it should be under pressure at least equal to the working pressure of the system, but not less than 60 pounds per square inch. A pump and pressure gage will be needed to make the test.

WATER-SUPPLY PIPING

Materials

Galvanized pipe or copper tubing is normally used for water-supply, or distribution piping. However, these two materials should not be joined directly to each other (see p. 13).

Copper tubing may cost a little more than galvanized pipe, but it is easier to install and has a smoother inside surface. The smoother surface means less pressure loss, which may permit use of smaller-diameter pipe.

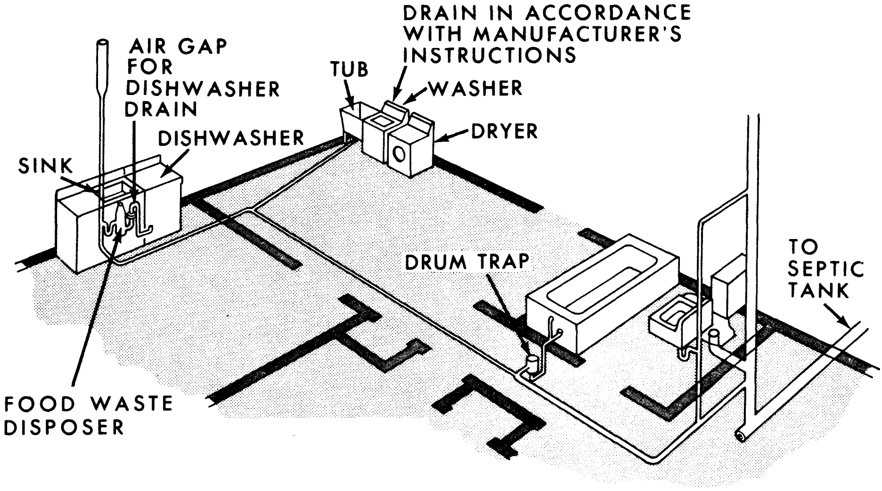

Figure 4.—Drainage-system layout for the arrangement in figure 3.

Both hard-drawn (rigid) and soft-drawn (flexible) copper tubing are available. The soft-drawn tubing can be installed with long sweeping bends. Less pressure is lost when water runs through sweeping bends than when it makes abrupt changes in direction.

Characteristics of the water should be considered when selecting piping. Some waters corrode some piping materials. Check with neighbors who use water from the same water-bearing stratum; their experience can guide you in selecting the piping material. Or, have a chemical analysis made of a sample of the water. Your State college or university may be equipped to make an analysis. If not, it can direct you to a private laboratory. Firms in the water treatment equipment business make analyses for prospective customers.

Size

Water-distribution piping should be as short and as straight as possible. The longer the pipe and the smaller its diameter, the greater the loss of pressure. Some pressure is lost whenever water passes around bends and through elbows and other fittings.

Ordinarily, ¾-inch pipe is large enough for the main water-distribution pipes in a single-family house. Branch pipes to the fixtures are usually smaller. Local plumbing codes should be checked for specific requirements. Minimum sizes recommended for branch lines to fixtures are:

Fixture	*Minimum pipe size in inches*
Bathtub, dishwasher, kitchen sink, laundry trays, shower stall, and hose connections	½
Lavatory and water closet	⅜

DRAINAGE PIPING

The building drainage system includes all piping that carries sewage or other liquid waste to the building sewer, which, in turn, carries it to the disposal facility. Since the escape of sewage or sewer gases can be a serious health hazard, this system must be as carefully designed and installed as the water-distribution system.

Plastic Piping

The plastic pipe industry is still a developing industry and many different formulations of plastics are being used for making pipe. They vary considerably in strength, impact resistance, useful temperature range, deterioration by sunlight, and other characteristics. The formulation known as polyethylene (PE) is the most widely used—principally for cold water service lines. Formulations suitable for residential hot water lines are still in the experimental stage. Formulations intended for cold water lines should *not* be used for hot water lines. These formulations begin to lose strength gradually at temperatures just above room temperature and some are reduced to their useful limit at about 125° F.

Plastic pipe is also on the market for drainage, waste, and vent (DWV) lines—usually either polyvinyl chloride (PVC) or acrilonitrile-butadiene-styrene (ABS) formulations. These have a useful temperature range up to about 140° to 180° F., the maximum temperature depending upon the exact formulation.

Plastic piping offers several advantages: It is light in weight, easily worked, and practically immune to attack by natural waters, and some formulations can stand a limited amount of freezing. On the other hand, it has the disadvantages of limited structural and impact strength, loss of shape and strength when subjected to higher temperatures, and susceptibility to damage by gnawing rodents under certain conditions.

Selection and use of plastic piping for plumbing should be in accordance with manufacturers' instructions. Only plastic pipe bearing the National Sanitation Foundation (NSF) Seal of Approval should be used for supplying potable water.

A house or building drainage system generally includes these basic parts:

Fixture drain.—The piping through which a fixture drains. Each fixture must be trapped and vented.

Fixture branch—A pipe connecting several fixture drains.

Soil stack—The vertical soil pipe into which the water closet or other fixture having a similar function drains, with or without the discharge from other fixtures. It connects to the building drain and is vented up through the roof to the outside air. The vent portion is called the stack vent.

Building drain—The main horizontal drain that receives the discharge from soil, waste, or other drainage pipes inside the building and carries it outside the building to the building sewer, which carries it to the disposal facility.

Materials

Drainage piping may be made of cast iron, galvanized wrought iron or steel, copper, brass, or plastic. Cast iron is commonly used for building drains that are buried under concrete floors or underground. Steel pipe should not be laid underground or under concrete.

Size and Slope

Wastes normally flow through the drainage system by gravity. (Sometimes wastes flow by gravity to a sump, then are lifted by a pump.) The drainage piping must be of the proper size and slope to insure good flow.

Local plumbing codes should be checked for the sizes of drain pipe required. Minimum sizes recommended are:

Piping for—	*Minimum size in inches*
Fixture drains:	
Bathtub, dishwasher, kitchen sink, and laundry trays	1½
Lavatory	1¼
Floor drain and shower stall	2
Water closet	3
Fixture branch	1½
Soil stack	3
Building drain:	
Beyond soil stack connection	3
Above soil stack connection	([1])

[1] Not less than connecting branch.

Horizontal drainpipes—pipes that slope less than 45° from the horizontal—3 inches or less in diameter should slope at least one-fourth of an inch per foot. Larger pipes should slope not less than one-eighth of an inch per foot.

Traps and Venting

Gases develop in sewers and septic tanks and flow back through the drainage piping system. To prevent these gases from backing up through open fixture drains or overflows and escaping into the house, a trap is required at each fixture (figs. 5 and 6). The trap should be the same size as the drainpipe and as close as possible to the fixture outlet. The water seal in the trap should be at least 2 inches, but not more than 4 inches. Water closets usually have built-in traps and no additional one is required. Never double-trap a fixture.

Grease Traps

A grease trap is different from a fixture trap and serves an entirely different purpose. It is designed to prevent greases and fats from entering a sewerage system. It should be used only where large amounts of grease may be discharged into the waste disposal system—for example, in a restaurant or boarding house. It is not needed in the average dwelling.

If used, a grease trap should not receive the discharge from a food waste disposer. Grease accumulations must be removed from the trap at frequent intervals.

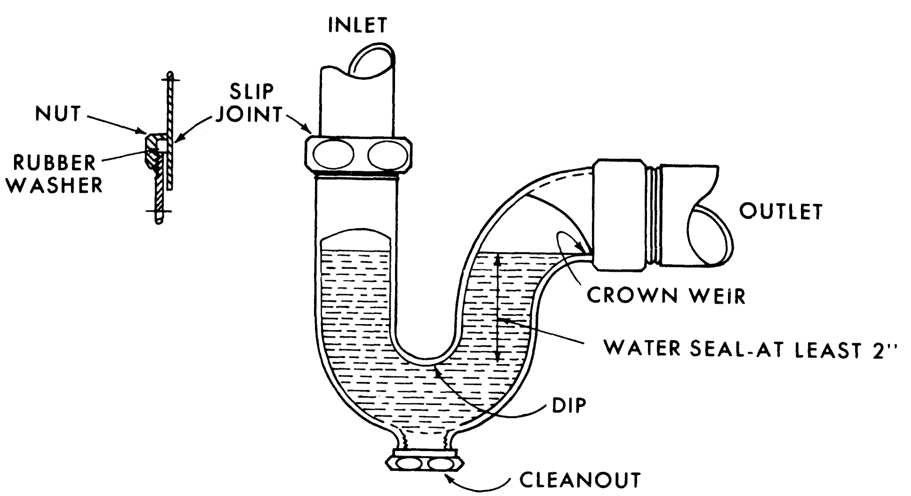

Figure 5.—P trap assembly.

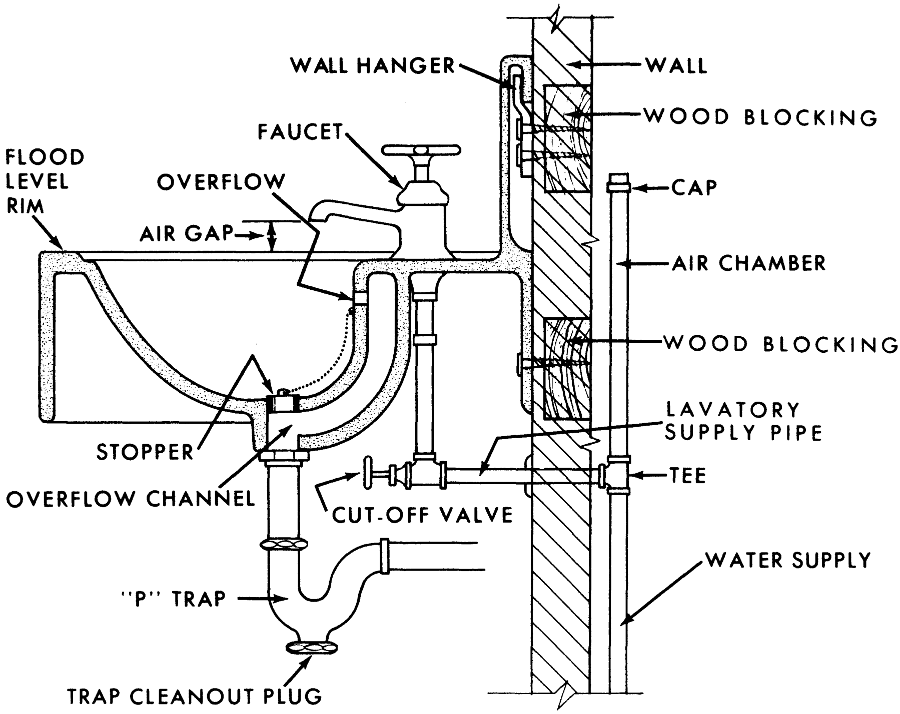

Figure 6.—Lavatory, showing water-supply and drainage piping. Note air gap at faucet and air chamber. An air chamber prevents water hammer.

Drum traps (see fig. 7) are commonly used in bathtub drain lines. A trap should be 3 or 4 inches in diameter, and the bottom or top should be removable to permit cleaning of the trap and drainpipe.

Sewer gases that are confined can develop pressure and bubble through the water seal in fixture traps. Therefore, at least one vent must be provided through which these gases can escape to the outside air and thus prevent any buildup of pressure or vacuum on the trap seal.

The soil stack should always be vented to the outside, above the roof and undiminished in size. Additional vents directly to the outside may be needed or required for individual fixtures. Plumbing codes specify the venting required. Where there is no code, the recommendations given herein may be followed.

A vent pipe (or stack, as the vertical portion is called) should extend far enough above the roof to prevent it from being blocked by snow, but at least 6 inches. The opening in the roof through which the pipe passes must be flashed (tightly sealed) to make it watertight (fig. 8).

In very cold climates, the part of a vent above the roof should be at least 3 inches in diameter to prevent frost closure in cold weather. Where individual vents are used for fixtures, 1½-inch pipe is recommended. Vent increasers (see fig.

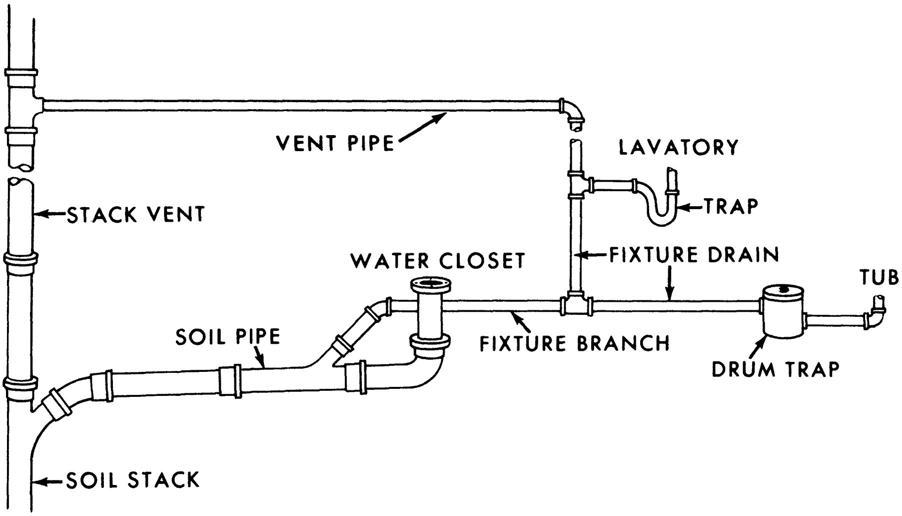

Figure 7.—Method of venting a group of bathroom fixtures.

8) may be used to increase the diameter of the vent stacks above the roof.

Each fixture drain must be vented to prevent the siphoning of the water from the fixture trap. Figures 1, 2, 4, and 7 show the methods of venting fixture drains. Vent piping for each fixture should be installed between the trap and the sewerline, and should be the same size as the drain piping. If connected to the soil stack, the vent piping should be connected above the highest fixture drain. Otherwise, it should extend separately to above the roof. The distance from the fixture trap to the vent is governed by the size of the fixture drain. Maximum distances recommended are:

Size of fixture drain (inches)	*Maximum distance from trap to vent (feet)*
1¼	2½
1½	3½
2	5
3	6
4	10

It is a good idea to plan the locations of fixtures so that most, if not all, can be vented through one stack. For example, figure 1 shows that by locating the bathroom next to the kitchen, it is practical to vent all fixtures in both rooms through the one stack. This consideration should not necessarily dictate overall room arrangement.

Floor Drains

Floor drains are required in shower stalls, milkrooms, and milking parlors. They are often installed in laundry rooms, basements, and utility rooms.

Floor drains should be trapped. If the building drain is laid under the floor, it must be at a sufficient depth to permit installation of the trap. Floor drains are usually set close enough to the building drain to make separate venting unnecessary.

A floor drain should be flush with the floor, and the floor should slope toward the drain from all directions. The grating of the drain should be removable so the drain can be cleaned.

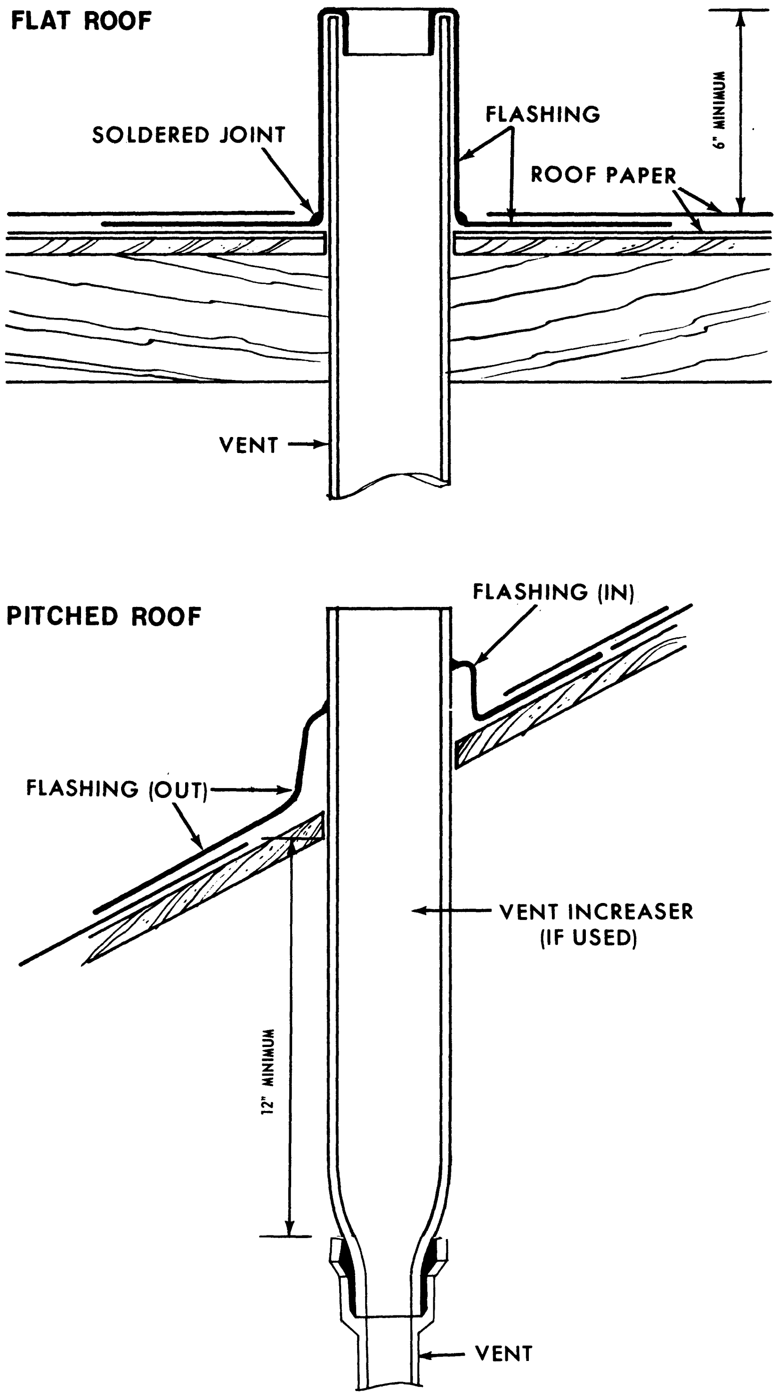

Figure 8.—Installation of roof flashing around vent stacks.

PIPE FITTINGS AND CLEANOUTS

Fittings

If copper tubing is joined directly to galvanized-iron or steel piping, electrolysis will take place under certain conditions and the joint will eventually corrode. Special non-electrical-conducting fittings are available for joining copper tubing to iron or steel piping.

Pipe fittings, such as elbows, tees, nipples, reducers, and couplings, when used with iron or steel pipes, are usually made of the same material as the pipe. Brass fittings are used with brass pipes and copper tubing.

Valves and faucets are usually made of brass or wrought copper. Brass valves made for use with wrought iron, steel, and rigid copper tubing are threaded; those for use with flexible copper tubing are designed for soldering.

Sections of copper tubing and their fittings are joined by soldering. The soldering should be done as follows:

1. Clean the tube end and the cup (inside) of the fitting with steel wool or emery cloth. Remove all loose particles after cleaning. Clean surfaces are essential for good solder connections.
2. Apply a thin coat of flux to the cleaned surfaces of both the tube and the fitting.
3. Assemble the tube and fitting.
4. Apply heat and solder. Heat by directing the flame onto the fitting toward the tube until the solder melts. The solder will flow and fill the joint.
5. Remove excess flux and solder with a small brush or soft cloth while the metal is still hot.
6. Allow the joint to cool, without moving it.

Cast-iron drainage pipe sections and fittings are usually of the bell-and-spigot type and are joined by packing with hemp tow or oakum and sealing with lead (fig. 9). The joint must be fitted and packed so that the sections are concentric, leaving no obstructions to the flow of liquid or projections against which solids can lodge. The direction of waste flow must always be as shown in figure 9.

Branch drainpipes should be connected to larger drainpipes so that the direction of flow in the system is maintained (see fig. 7).

Where a change in the direction of drainage piping is necessary, sweep bends (fig. 10) should be used whenever possible, because angled turns tend to reduce the rate of flow.

Cleanouts

Wastes that will cling to the inside of pipe walls are sometimes discharged into drainage systems.

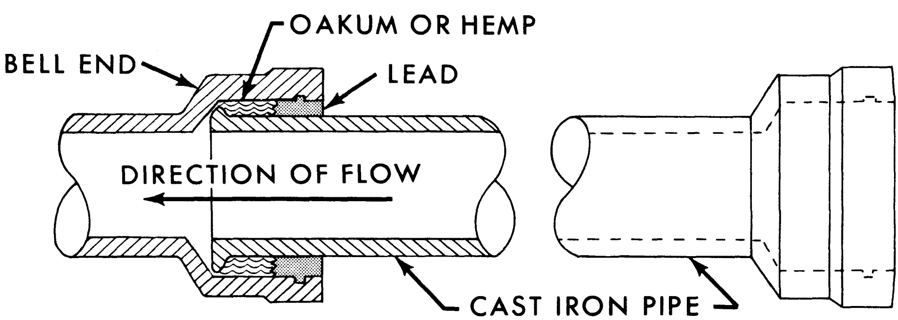

Figure 9.—Bell-and-spigot joint in cast-iron pipe.

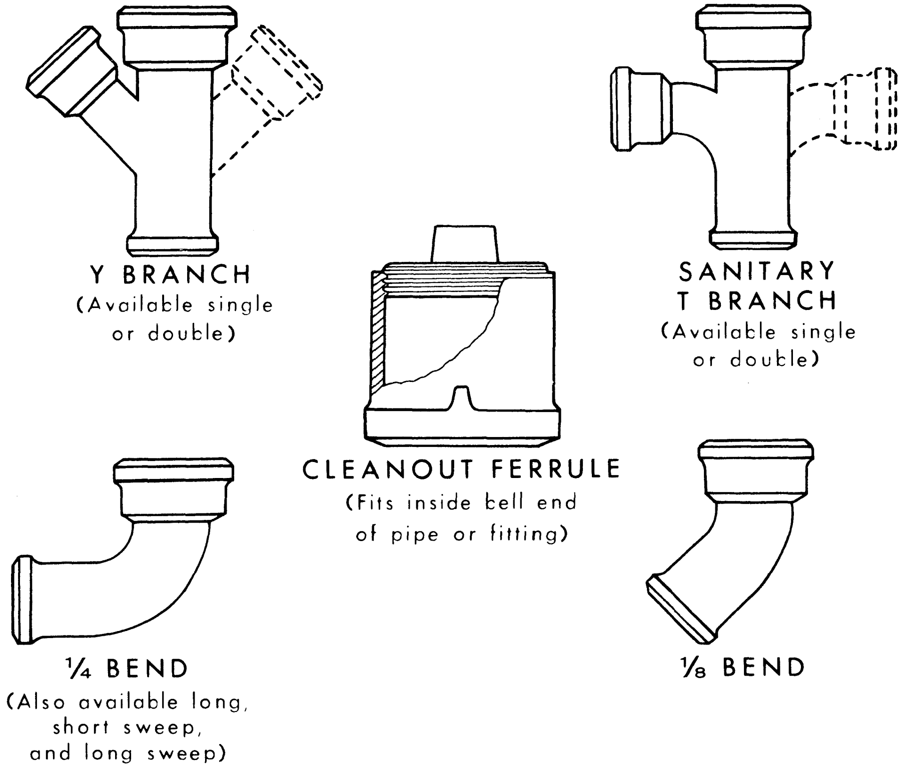

Figure 10.—Common cast-iron soil-pipe fittings.

Also, when cool, greases congeal and may stick to pipe walls. To permit cleaning of pipes, cleanouts should be provided through which such matter can be removed or dislodged.

Cleanouts usually consist of 45-degree Y-fittings with removable plugs (figs. 11 and 12). They should be the same size as the pipe in which they are installed.

Cleanouts should be installed where they are readily accessible and where cleanout tools can be easily inserted into the drainpipe. Place one cleanout at or near the foot of the soil stack (fig. 12). Install others at intervals of not more than 50 feet along horizontal drainage lines that are 4 inches or less in diameter.

FIXTURES

Many styles of each type of plumbing fixture are available. Selection is mostly a matter of personal preference. The style and size of a fixture should harmonize with the room in which it is installed.

When designing a new house or building, allow enough space for the desired fixtures. When selecting new fixtures for existing buildings, be sure they will fit into the space available. Draw to scale floor plans of the rooms in which fixtures will be installed (for example, ¼ or ½ inch can equal 1 foot). Arrange cardboard cutouts of the fixtures,

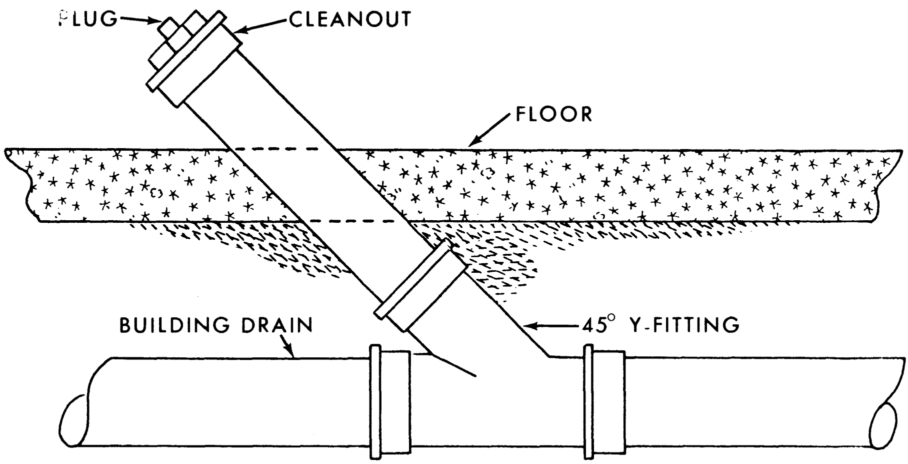

Figure 11.—A 45° Y-fitting and cleanout in building drain.

drawn to the same scale, on the floor plans. Home and Garden Bulletin 99, "Planning Bathrooms for Today's Homes," contains cutouts of bathroom fixtures drawn to ¼- and ½-inch scales, and arrangements for bathrooms showing desirable clearances around or between fixtures (see list of publications on p. 2). Manufacturers of plumbing fixtures sometimes have cutouts of their equipment available for planning purposes.

Some plumbing fixtures are supported on the floor alone, some on the wall alone, and some partly on each. Support must be substantial; otherwise a fixture may pull away from the wall and leave a crack. Appropriate carriers or brackets are available for supporting wall-hung fixtures. Guidance on necessary support framing and attachment may be had from fixture manufacturers or dealers.

Water closets are available for either floor or wall mounting. The floor-mounted type bolts to a floor flange, which in turn attaches to the floor (fig. 13) or to the closet bend

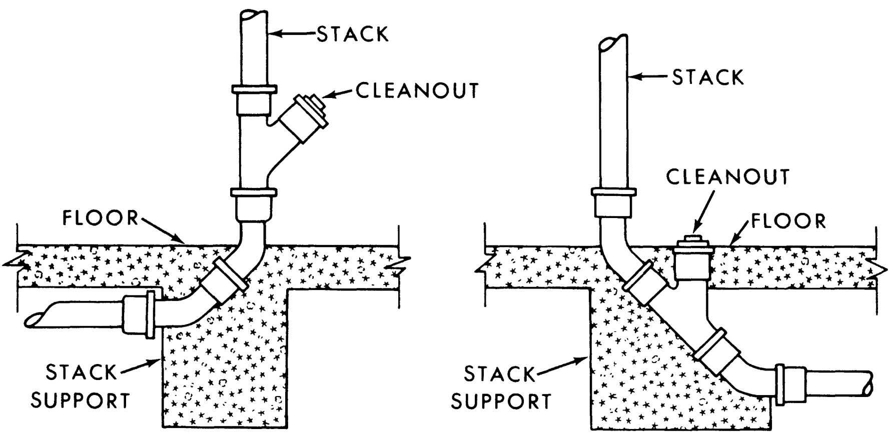

Figure 12.—Soil and waste pipe cleanouts and supports.

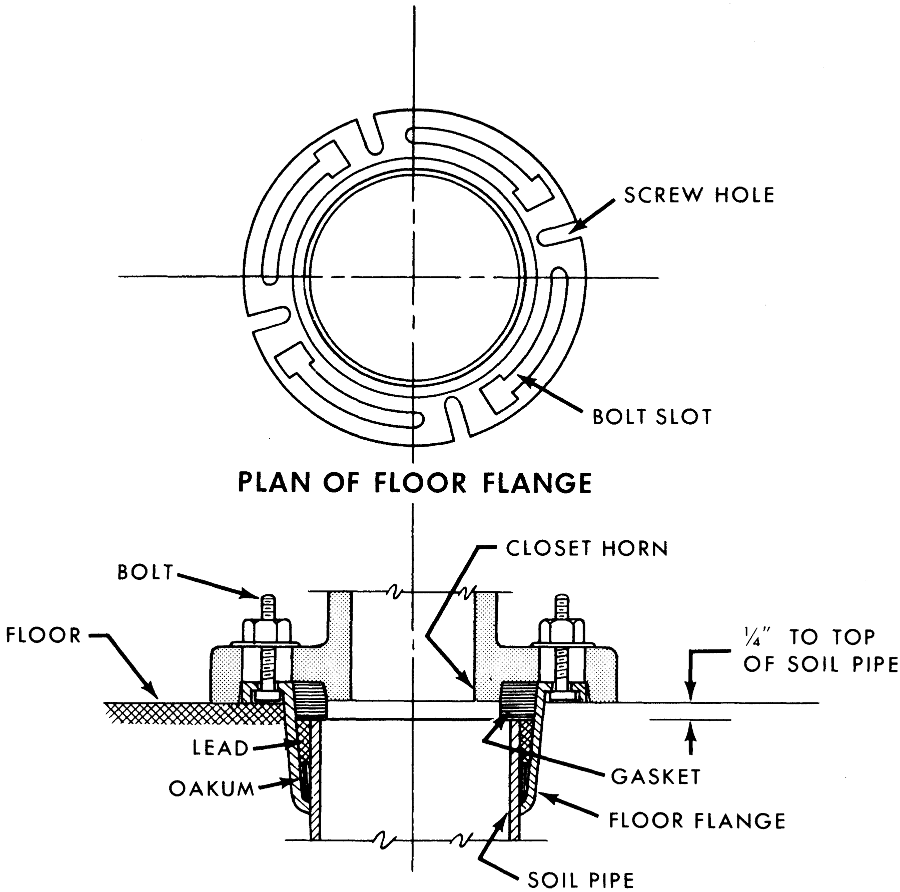

Figure 13.—One method of connecting a water closet to the soil pipe.

below. The wall-mounted type is supported by carriers attached to the wall studding or to both the wall and the floor (chair carriers). Six-inch wall studding is recommended if wall-type carriers are used. Tubs are available either for floor support alone or for floor and wall support combined, and may require additional framing in the wall or floor, or in both.

Faucet spouts must be high enough above a lavatory or sink rim to prevent water in the fixture from being drawn back into the faucet if a vacuum should be created in the plumbing system. The height, which is known as "air gap," should be at least twice the diameter of the faucet opening (see fig. 6). Normally it should not be less than 1 inch for lavatories; 1½ inches for sinks, laundry trays, and ¾-inch bath faucets; and 2 inches for 1-inch bath faucets.

Water Treatment

Water for domestic use may require treatment to make it suitable. An analysis will determine the treatment required. Dealers can advise on the selection and use of water-treatment equipment.

Plumbing Check for House Buyers

If you are considering buying a previously occupied house, you should examine and evaluate the condition of the plumbing. The following questions will suggest features that should not be overlooked:

Are there water stains in the building, indicating leaks in the water-supply or drainage piping? If so, have the leaks been corrected satisfactorily?

Is the flow of water from the faucets good and strong, indicating absence of corrosion or scaling in the supply piping? If not, can the deficiency be corrected economically?

Do the fixtures drain quickly and quietly and maintain the water seals in the traps, indicating an adequate vented drainage system? If not, can the deficiency be corrected economically?

Are all fixtures and piping firmly anchored or supported?

Does the water closet flush completely and shut off completely? Does the tank refill quietly? If not, can the deficiency be corrected economically?

Do faucets and valves operate freely and close completely? If not, can the deficiency be corrected economically?

Are the fixtures chipped and stained? Do they need to be replaced?

Do the stoppers hold? If not, can they be readily and cheaply replaced or repaired?

WATER HEATERS

A house plumbing system usually includes a water heater or a hot-water storage tank if the water is heated in the central heating plant. (Water heaters are also required in milkhouses, see p. 19.)

Electric, gas, and oil-fueled water heaters are available. Each type comes in a wide variety of sizes. Instructions for connecting water heaters to plumbing systems come with the units. The tanks have the necessary internal piping already installed and the only connections required are the hot- and cold-water and fuel lines. Gas- or oil-fired water heaters require flues to vent the products of combustion.

Pressure and temperature relief valves are essential and should be on all water heaters and hot-water storage tanks. Their purpose is to relieve pressure in the tank and pipes if other control equipment fails and the water temperature goes high enough to generate dangerous pressure. As water heats it expands, and the expansion may be enough to rupture the tank or pipes if the water cannot be forced back into the cold-water line or discharged through a relief outlet.

The size of hot-water storage tank needed in the house depends upon the number of persons in the family, the volume of hot water that may be required during peak use periods (for example, during bathing or laundering periods), and the "recovery rate" of the heating unit. Household water heaters are generally available with tanks in a range of sizes from about 30 to 80 gallons.

The "recovery rate" of water heaters varies with the type and capacity of the heating element. In standard conventional models, oil and gas heaters usually have higher recovery rates than electric heaters of similar size. However, a relatively new "quick recovery" type of electric water heater is available. Its two high-wattage heat-

ing elements provide hot water at a rapid rate.

For a family of 4 or 5 persons, tank sizes should be about 30 to 40 gallons for oil or gas heaters, 40 gallons for quick-recovery electric heaters, and 40 to 52 gallons for standard electric heaters. For larger families, or where unusually heavy use will be made of hot water, correspondingly larger capacity heaters should be installed. Advice on the size needed may be obtained from Extension home demonstration agents, equipment dealers, and power company representatives. Power suppliers may offer special reduced rates for electric water heating. If "off peak" electric heating will be used, be sure that the tank will hold enough hot water to last from one heating period to the next.

PROTECTING WATER PIPES FROM FREEZING

If water freezes in a pipe, the pipe may be ruptured or otherwise damaged.

Freezing will not occur if a pipe is well insulated (fig. 14) and the water is allowed to flow continuously. However, insulation does not stop the loss of heat—it merely reduces the rate of loss—and the water may freeze if it stands in a pipe, even a well-insulated one, for some time in cold weather.

Pipes laid in the ground are usually difficult to insulate effectively because of moisture; insulation must stay dry to be effective. But a pipe laid below the frostline is not likely to freeze even if not insulated.

In areas subject to freezing temperatures, it is advisable not to install water pipes in outside walls of buildings. Should it be necessary to do so, they should be protected from freezing.

Electric heating cable can be used to prevent pipes from freezing. Each unit of cable should be folded

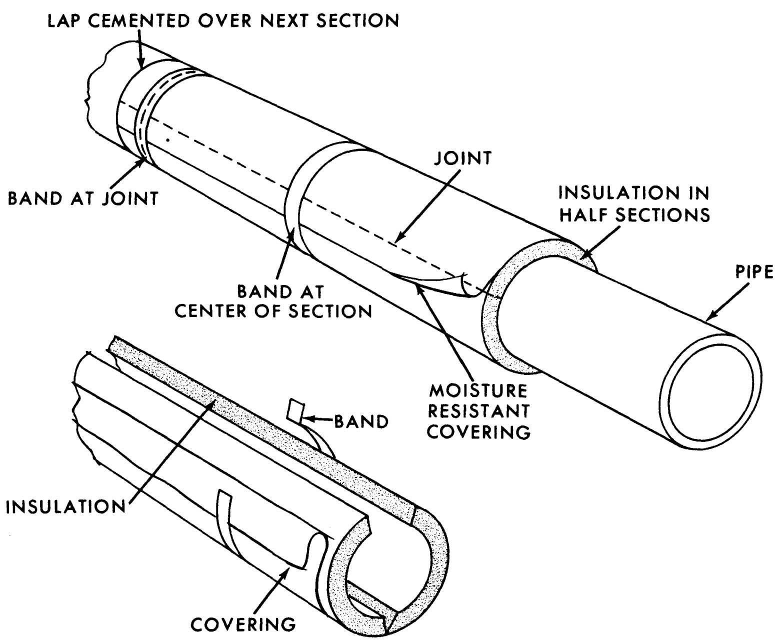

Figure 14.—One method of applying insulation to pipe.

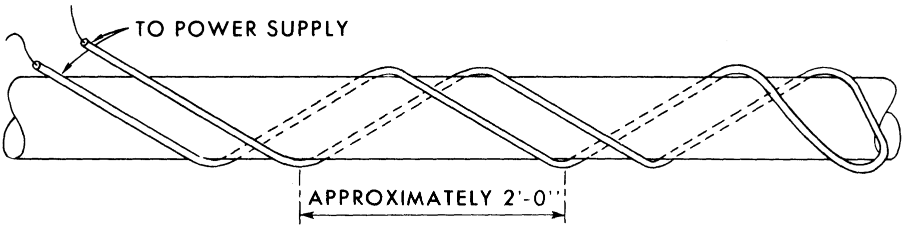

Figure 15.—Application of heating cable to pipe to prevent freezing.

at the midpoint and wrapped around the pipe as shown in figure 15. Electric heating cable may also be used to thaw frozen pipe.

CONDENSATION

In areas where the air gets hot and humid, condensation (sweating) is very likely to occur on pipes carrying cold water. This can be prevented by insulating the pipes. The insulation will also help to keep the water cool. To prevent condensation from collecting in the insulation, it should be covered with a good vapor barrier. Vapor barriers are ordinarily available from the same sources as the insulation.

Condensation may also occur on a water-closet tank in hot, humid weather. This may be prevented either by insulating the tank or by warming the water before it enters the tank. Insulating jackets, or liners, that fit inside water-closet tanks are available. When installed, they prevent the water from cooling the outer surface of the tank. Small electric heating units and tempering devices are available for warming the water. The tempering devices connect to both the hot- and cold-water lines and mix hot water with the cold water entering the tank.

SERVICE-BUILDING PLUMBING

Water-Supply Piping

Water is needed in all buildings and yards where livestock are kept.

In stall-type dairy barns, water is usually provided by means of water bowls. The bowls must be designed to prevent back siphoning of water into the water-supply piping. This may be done by using valves with outlets above the overflow rim of the bowl (fig. 16).

The supply piping for water bowls is often mounted on the stall frame where it may be subject to freezing. Freezing can be prevented by wrapping heating cable around the pipe, and covering the cable and pipe with insulation (figs. 14 and 15). If the pipe is laid underground, the riser to the bowl must be protected against freezing.

Precautions against back siphoning of water into the supply piping and against freezing must also be taken with troughs and other types of stock waterers. Heating devices are available to prevent freezing.

Where there is danger of the pipes freezing in service buildings, a stop-and-waste valve should be installed between the building service pipe and the distribution piping. The valve, which may be buried in the ground where the service pipe enters the building, will permit draining the piping in the building during cold weather. When the valve handle, which extends above the ground, is closed, the water in

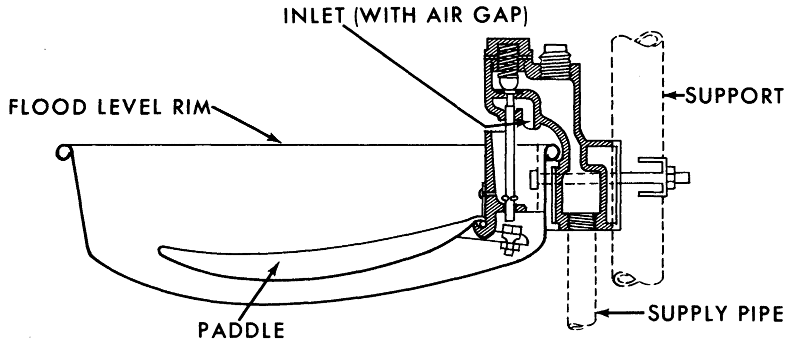

Figure 16.—Livestock watering bowl.

the service pipe drains through an opening in the valve into the ground. If the ground around the valve is not sufficiently porous to absorb the drainage, it should be made so by packing with gravel or broken stone.

In cold climates, outdoor faucets should be the frostproof type. Frostproof hydrants are designed to drain the water left in them when they are turned off. This prevents freezing.

Water is needed for washing down stall barns and milking parlors. Both hot and cold water should be provided in the operator area of milking parlors for washing udders, rinsing pails, and other cleaning.

Hot and cold water are required in the milkhouse or milk room. **Note: Consult your dairy inspector regarding regulations before installing milkhouse plumbing.** A water heater should be included in the milkhouse plumbing system. Water heaters for the dairy are usually larger than those used for household water heating and may operate at a higher temperature. On large dairy farms where a considerable amount of equipment must be washed and sterilized, a steam boiler may be advisable.

Hose connections or other outlets should be provided for flushing paved livestock feeding and resting areas.

Drainage Piping

Proper handling and disposal of dairy building wastes—especially from the gutters in stall barns, in milking parlors, and in milk rooms—is essential to prevent contamination of dairy products. Local health authorities should be consulted when planning a dairy waste-disposal system. All requirements in the milk code must be followed.

Milkhouse drainage systems must be adequate to carry away the waste water from washing utensils, the milk-cooling equipment, and the milkhouse. In small milkhouses, one 4-inch drain may be adequate; in larger ones, two drains may be needed—one under the washing vat and one in the center of the floor. The milkhouse wastes should not drain into the household sewage-disposal system, but into a separate system. Milkhouse drains should be trapped and vented; the method is the same as for house drains.

Your milk code may require a washroom with a lavatory and water closet for use by the dairy help. Wastes from this washroom are sewage and should not drain into the milkhouse or barn waste-disposal systems. Either provide a separate disposal system or, if practical, use the household sewage-disposal system.

U.S. GOVERNMENT PRINTING OFFICE: 1966 O—789-190